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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/732,839	12/10/2003	Chayan Mitra	134446	6720

41838 7590 08/23/2005

GENERAL ELECTRIC COMPANY (PCPI)  
C/O FLETCHER YODER  
P. O. BOX 692289  
HOUSTON, TX 77269-2289

EXAMINER
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PIZARRO CRESPO, MARCOS D

ART UNIT	PAPER NUMBER
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2814

DATE MAILED: 08/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No.	Applicant(s)	
	10/732,839	MITRA ET AL.	
	Examiner	Art Unit	
	Marcos D. Pizarro-Crespo	2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 13 June 2005.
- 2a) ☒ This action is FINAL.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,2 and 4-24 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☐ Claim(s) \_\_\_\_\_ is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 December 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

Application/Control Number: 10/732,839 (Final Rejection)  
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Attorney's Docket Number: 134446-1/YOD GERD:0197

Filing Date: 12/10/2003

Claimed Foreign Priority Date: none

Applicant(s): Mitra, et al.

Examiner: Marcos D. Pizarro-Crespo

### **DETAILED ACTION**

This Office action responds to the amendment filed on 6/13/2005.

#### ***Acknowledgment***

1. The amendment filed on 6/13/2005 responding to the Office action mailed on 3/10/2005 has been entered. The present Office action is made with all the suggested amendments being fully considered. Accordingly, pending in this Office action are claims 1,2, and 4-24.

#### ***Drawings***

2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned on par.0017/II.5 in the description with respect to figure 4: **420**. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement-drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the examiner does not accept the changes, the

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applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Specification***

3. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

### ***Claim Rejections***

4. Initially, and with respect to claims 10, 11, 21, and 22, note that a limitation in a claim with respect to the manner in which a claimed device is intended to be used does not differentiate the claimed device from a prior-art device if the prior-art device teaches all structural limitations in the claims and the functional limitations are found to be inherent in the prior art device. *In re Schreiber*, 128 F.3d 1473, 1477-78, 44 USPQ2d 1429, 1431-32 (Fed. Cir. 1997); *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). See *Hewlett-Packard Co. v. Bausch & Lomb Inc.* and the related case law cited therein which makes it clear that it is the final product *per se* which must be determined in a device claim, and not the patentability of its functions (909 F.2d 1464, 1469, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990)). As stated in *Best*,

Where the claimed and prior art products are identical or substantially identical in structure or composition, a *prima facie* case of either anticipation or obviousness has been established. *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977).

5. **Note that the applicant has burden of proof** once the examiner establishes a sound basis for believing that the products of the applicant and the prior art are the

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same or substantially the same. See *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990).

***Claim Rejections - 35 USC § 102***

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1 and 2 are rejected under 35 U.S.C. 102(b) as being anticipated by Nishizawa (US 4799090).

8. Regarding claim 1, Nishizawa shows (see, e.g., fig. 7) all aspects of the instant invention including a transistor switch comprising:

- ✓ A source region **11**
- ✓ A drain region **14**
- ✓ A graded channel region comprising at least two doping levels **12/13** between the source/drain regions **11/14**
- ✓ A gate region **21** extending along a sidewall of the channel
- ✓ A gate contact **21'** directly contacting the gate region **21**

9. Regarding claim 2, Nishizawa shows (see, e.g., fig. 7) the doping level **12** at the source regions is higher than that **13** at the drain region.

***Claim Rejections - 35 USC § 103***

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

12. Claims 1, 2, and 4-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hatakeyama (US 2003/0178672) in view of Siergiej (US 5945701).

13. Regarding claim 1, Hatakeyama shows (see, e.g., fig. 1) most aspects of the instant invention including a transistor switch comprising:

- ✓ A source region **3a**
- ✓ A drain region **1**
- ✓ A channel region **2**
- ✓ A gate region **9** extending along a sidewall of the channel region **2**
- ✓ A gate contact **12** directly contacting the gate region **9**

Hatakeyama, however, fails to show the channel region as a graded region comprising at least two doping levels. Siergiej (see, e.g., col.5/ll.1-5), on the other hand, teaches that providing said graded region to Hatakeyama would achieve a

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uniform transconductance and voltage gain throughout the input signal range of the transistor.

It would have been obvious at the time of the invention to one of ordinary skill in the art to provide Hatakeyama's channel with a graded region comprising two doping levels, as suggested by Siergiej, to obtain a uniform transconductance and voltage gain throughout the input signal range of the transistor.

14. Regarding claim 2, Siergiej shows (see, e.g., fig. 11) that the doping level at the source region is higher than that at the drain region.

15. Regarding claims 4 and 5, Siergiej shows that the transistor switch is implemented using silicon carbide (see, e.g., col.2/ll.59).

16. Regarding claims 6 and 17, Siergiej shows (see, e.g., fig. 11) the graded channel comprising three doping levels.

17. Regarding claims 7 and 18, Siergiej shows (see, e.g., fig. 11) the doping levels of the graded channel are:  $10^{15}$  electrons/cm<sup>3</sup> (lower step level),  $5 \times 10^{15}$  electrons/cm<sup>3</sup> (middle point of curve 66), and  $10^{16}$  electrons/cm<sup>3</sup> (upper step level). In addition, Hatakeyama teaches about the importance of the doping level in the channel region. See, e.g., par.0063/ll.5-10, where Hatakeyama explains that the doping level of the channel will determine the breakdown voltage of the device. They, however, both fail to show the claimed concentration of  $10^{17}$  electrons/cm<sup>3</sup> for any of the three doping levels. In spite of that, differences in concentration will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentrations are critical. "Where the general conditions of a claim are disclosed in the

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prior art, it is not inventive to discover the workable ranges by routine experimentation”.

*In re Aller*, 220 F.2d 454,456,105 USPQ 233, 235 (CCPA 1955).

Since the applicants have not established the criticality (see next paragraph) of the claimed concentrations, it would have been obvious to one of ordinary skill in the art to use these values in the device of Hatakeyama/Siergiej.

### CRITICALITY

18. The specification contains no disclosure of either the critical nature of the claimed concentrations or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the applicant must show that the chosen dimensions are critical. *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

19. Regarding claims 8, 9, 19, and 20, Hatakeyama shows the doping level of the source and drain regions is  $1 \times 10^{20}$  and  $1 \times 10^{19}$  electrons/cm<sup>3</sup>, respectively, and that the doping level of the gate region is  $1 \times 10^{18}$  holes/cm<sup>3</sup>. He, however, fails to show the specific claimed concentrations of  $1 \times 10^{18}$  electrons/cm<sup>3</sup> for the source/drain regions and  $5 \times 10^{18}$  holes/cm<sup>3</sup> for the gate region. However, differences in concentration will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentrations are critical. “Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the workable ranges by routine experimentation”. *In re Aller*, 220 F.2d 454,456,105 USPQ 233, 235 (CCPA 1955).

Since the applicants have not established the criticality (see paragraph 18 above) of the claimed concentrations, it would have been obvious to one of ordinary skill in the art to use these values in the device of Hatakeyama/Siergiej.



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20. In reference to the language in claims 10, 11, 21, and 22 referring to the function of the transistor, it is noted that Hatakeyama/Siergiej shows all structural aspects of the semiconductor device according to the claimed invention (see paragraph 13 above and 25 below) and that operating the transistor at a specific frequency is a function that does not affect the structure of the final device. See, e.g., Richard (US5903020, col.1/ll.35, col.7/ll.66), who teaches that Hatakeyama/Siergiej's transistor typically operates at more than 1 GHz.

21. Regarding claims 12 and 23, Siergiej (see, e.g., col.5/ll.42) shows that the breakdown voltage of the device is more than 60 volts.

22. Regarding claims 13 and 24, Siergiej shows that the breakdown voltage of the transistor is 200 volts instead of the claimed 210 volts. As taught by Hatakeyama (see, e.g., par.0063/ll.6-8), the breakdown voltage of the device could be adjusted by manipulating the impurity concentration and thickness of the channel region. However, differences in concentration and thickness will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentrations are critical. "Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the workable ranges by routine experimentation". *In re Aller*, 220 F.2d 454,456,105 USPQ 233, 235 (CCPA 1955).

Since the applicants have not established the criticality (see paragraph 18) of the claimed breakdown voltage, it would have been obvious to one of ordinary skill in the art to use this value in the device of Hatakeyama/Siergiej.

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In addition to the above, the 200-volts breakdown voltage of Siergiej's transistor appears to be close enough to the claimed breakdown voltage of 210 volts that one of ordinary skill in the art would have expected both transistors to have the same properties. See *Titanium* and the related case law cited therein, which makes it clear that a *prima facie* case of obviousness exists where the claimed and prior art values do not overlap but are close enough that one skilled in the art would have expected them to have the same properties (*Titanium Metals Corporation of America v. Banner*, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985); see also MPEP§2144.05).

23. Regarding claim 14, Siergiej shows the transistor switch is implemented in high power-generating systems (see, e.g., col.1/ll.19).

24. Regarding claim 15, Hatakeyama shows the switch comprises a static induction transistor (see, e.g., col.1/ll.17-20).

25. Regarding claim 16, Hatakeyama shows (see, e.g., fig. 1) most aspects of the instant invention including a static induction transistor comprising:

- ✓ A source region **3a**
- ✓ A drain region **14**
- ✓ A channel region **2** between the source **3a** and drain **14** regions
- ✓ A gate region **9** extending along the sides of the channel region **2**
- ✓ A gate contact **12** directly contacting the gate region **9**

Hatakeyama, however, fails to show the channel as a graded region comprising at least two doping levels, wherein the doping level at the source region is higher than that at the drain region. Siergiej, on the other hand, teaches that providing said graded

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region to Hatakeyama would achieve a uniform transconductance and voltage gain throughout the input signal range of the transistor (see, e.g., col.5/ll.1-5).

It would have been obvious at the time of the invention to one of ordinary skill in the art to provide Hatakeyama's channel with a graded region comprising two doping levels, wherein the doping level at the source region is higher than that at the drain region, as suggested by Siergiej, to obtain a uniform transconductance and voltage gain throughout the input signal range of the transistor.

### ***Conclusion***

26. Papers related to this application may be submitted directly to Art Unit 2814 by facsimile transmission. Papers should be faxed to Art Unit 2814 via the Art Unit 2814 Fax Center. The faxing of such papers must conform to the notice published in the Official Gazette, 1096 OG 30 (15 November 1989). The Art Unit 2814 Fax Center number is **(571) 273-8300**. The Art Unit 2814 Fax Center is to be used only for papers related to Art Unit 2814 applications.

27. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Marcos D. Pizarro-Crespo** at **(571) 272-1716** and between the hours of 9:30 AM to 8:00 PM (Eastern Standard Time) Monday through Thursday or by e-mail via [Marcos.Pizarro@uspto.gov](mailto:Marcos.Pizarro@uspto.gov). If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy, can be reached on (571) 272-1705.

28. Any inquiry of a general nature or relating to the status of this application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status

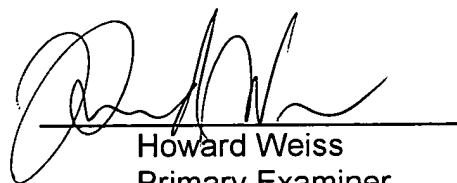
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information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

29. The following list is the Examiner's field of search for the present Office Action:

Field of Search	Date
U.S. Class / Subclass(es):	8/11/2005
Other Documentation:	
Electronic Database(s): EAST (USPAT, EPO, JPO)	8/11/2005

Marcos D. Pizarro-Crespo  
Patent Examiner  
Art Unit 2814  
571-272-1716  
[marcos.pizarro@uspto.gov](mailto:marcos.pizarro@uspto.gov)



Howard Weiss  
Primary Examiner  
Art Unit 2814